REMARKS

I. SPECIFICATION

The disclosure was objected to because of a lack of standard section headings in the specification.

The specification has been amended to provide the standard section headings that were mentioned in the Office Action in accordance with rule 77.

The specification has been carefully checked for grammatical and other errors that influence the understanding of the reader. No significant errors that required correction were found.

II. ABSTRACT

A new abstract has been provided above without legalistic wording ("present invention relates" has not been included in the new abstract). Also the subject matter related to method and marking system is presented more logically in separate sentences. The term "Figure 1" does not appear in the new abstract.

III. NEW CLAIMS SUPPORTED BY THE DISCLOSURE

New claims 13 to 20 were added and the original claims 1 to 12 were canceled. The original claims were English translations of claims of a foreign

patent document that were not drafted according to US Patent Office Rules. The new claims have been drafted according to the formal aspects of US Patent Office Rules and to include additional limitations to further distinguish the claimed invention from the cited prior art.

New independent method claim 13 includes the limitations of claims 1, 3, 4, 5, and 8, but does not use "and/or". The term "and/or" has been changed to "and". Also the method claim has been drafted in a standard form for a method claim in US Patent Practice, namely as a series of steps of performing certain positive actions. Thus claim 13 is fully supported by the disclosures in the specification because the originally claims 1, 3, 4, 5, and 8 were fully supported.

New dependent claims 14 to 18 only contain subject matter from the canceled dependent claims 2, 6, and 7.

New independent marking system claim 19 includes subject matter from claims 9, 10, and 12 and the additional feature that the marking control determines a start path of the marking device. This latter feature is taken from claim 5. Thus the subject matter of new claim 19 is fully supported by the original disclosure.

New dependent marking system claim 20 contains subject matter from canceled dependent claim 11.

IV. INDEFINITENESS AND CLAIM OBJECTION

Claim 8 was rejected as indefinite under 35 U.S.C. 112, second paragraph, for failing to particularly point out and distinctly claim the invention.

Claim 1 was objected to for lack of antecedent basis for claim terms.

Claim 8 was unfortunately mistranslated. The optical image-taking device according to new method claim 13, which includes the limitations of claim 8, does not calibrate the object. Instead the optical image-taking device, the object **and** ("or" is no longer used as in canceled claim 8) the one or more of the displacement devices 9, 10, 16 are "three-dimensionally calibrated" to each other according to the last paragraph of method claim 13.

Page 3, lines 12 to 23, especially lines 20 to 23, of the applicants' originally filed US specification supports the subject matter of the last paragraph of the new independent method claim 13.

Also the specification explains the meaning of "three-dimensionally calibrating": namely that the positions of the image-taking device, the object and the one or more displacement devices are referenced to **a single** coordinate system (of course in three dimensions) so that the flaws can be accurately marked. Furthermore one of ordinary skill in the art would understand the meaning of this term and understand how to make the invention with this feature.

In the applicants' method "design data" includes e.g. data that describes the shape and size of the object including position coordinates of all points on the

objects' surface with reference to a coordinate system of the object (see page 6, lines 20 to 24, and page 2, line 10, of applicants' specification). "Three-dimensionally calibrating" means that the picture taken showing the flaw or flaws is compared with the "design data" so that an exact assignment of the position of the flaw or flaws in terms of the position coordinates with reference to the object's coordinate system can be made, so that the flaw position is accurately known in this coordinate system. This should be easily understandable because, if the coordinate system is at one end of the object, e.g. one would determine the fraction of the length of the object from that end of the object to the flaw in the picture, which would give position coordinate in the horizontal direction from that end of the object exactly, given knowledge of the position coordinates at both ends of the object from the "design data". The other two dimensions would be handled in a similar manner. In addition to the explanation on page 3 of applicants' specification, note the explanation on page 1, where the comparatively inaccurate prior art method is described because in the known methods the location of the flaw is determined independently of the object with reference to the coordinates of the inspection system, not the object.

Since the term "three-dimensionally calibrating" is described and defined on page 3 of the specification, it is respectfully submitted that it is not an indefinite term.

With respect to antecedent basis for claim terms the claims have been checked and antecedent basis for claim terms appears to be maintained.

For the foregoing reasons it is respectfully submitted that new claims 13 to

20 should not be objected to because terms lack antecedent basis.

For the foregoing reasons it is respectfully submitted the new claims 13 to 20 should not be rejected as indefinite under 35 U.S.C. 112, second paragraph.

V. ANTICIPATION REJECTION

Method claims 1 to 3 and 6 were rejected under 35 U.S.C. 102 (b) as anticipated by Alders, et al.

Method claims 1 to 3 and 6 have been canceled, obviating their rejection on these grounds.

New independent method claim 13, as noted above, includes the limitations of canceled method claims 1, 3, 4, 5, and 8. Since new claim 13 includes the limitations of claims 4, 5, and 8, it clearly avoids anticipation by Alders, et al.

In fact, the Office Action on page 5, last two lines, admits that Alders, et al, fail to disclose the marking device is movable over the object by means of a displacement device.

It is well established that each and every limitation of a claimed invention must be disclosed in a single prior art reference in order to be able to reject the claimed invention under 35 U.S.C. 102 (b) based on the disclosures in the single prior art reference. See M.P.E.P. 2131 and also the opinion in ***In re Bond***, 15 U.S.P.Q. 2^{nd} 1566 (Fed. Cir. 1990).

For the foregoing reasons it is respectfully submitted that new claims 13 to

20 should not be rejected as anticipated under 35 U.S.C. 102 (b) by Alders, et al.

VI. OBVIOUSNESS REJECTIONS

Method claims 4 to 5 and marking system claim 9 were rejected as obvious under 35 U.S.C. 103 (a) over Alders, et al, in view of Kiba.

Method claim 7 was rejected as obvious under 35 U.S.C. 103 (a) over Alders, et al, in view of Larsson, et al.

Method claim 8 was rejected as obvious under 35 U.S.C. 103 (a) over Alders, et al, in view of Larsson, et al and Kiba.

Marking system claims 10 to 12 were rejected as obvious over Alders, et al, in view of Kiba, and further in view of Shimbara.

1. The New Method Claims

New independent method claim 13 includes limitations and features of canceled claims 1, 3, 4, 5, and 8, as well as some further limitations.

New dependent method claims 14 and 15 include the subject matter of canceled dependent claim 2. New dependent method claims 16 and 17 include the subject matter of canceled claim 6. The subject matter of canceled dependent claims 2 and 6 were each divided into two new dependent claims to avoid using terms such as "particularly", to avoid dependent claims of confusing or indefinite scope. Dependent claim 18 includes subject matter from canceled

claim 7.

A. Scope and Content of the Prior Art

US 6,320,654 B1, Alders, et al, discloses a system for detecting selected surface defects of a object body shell 2 comprising a sensor system 27, an optical measuring device 4, a computer system 5, and a marking system 32. The optical measuring device 4 comprises a projection device formed by radiation emitters 11, 13, 16, and 19 that generate a light tunnel or light curtain 23 that produces a specific grid pattern of lighter and darker grid pattern points on a measuring strip 24 on the surface of the body shell 2. CCD cameras 12, 14, 17 and 20 record the light 25 reflected from the surface from the body shell 2 as an image of the grid points at a specific angle and emit a corresponding test signal that is transmitted to the computer system 5. Surface defects requiring reworking are determined in the computer system 5 using state-of-the-art triangulations methods, wherein the computer system recognizes the surface unevenness on the basis of the test signal (see column 7, line 52 to column 8, line 62).

Further, a marking device 32 is mounted downstream from the optical measuring device 4. The marking device comprises marking nozzles 38, 39, 44 charged with water-soluble paint for marking relevant surface defects 40, 41. The marking nozzles 38, 39, 44 may perform a controlled movement. Surface defects are recognized as relevant ones requiring reworking through comparison with defect patterns stored in the computer. The position and shape of the image of

the reflected grid image elements, which generally represent a displacement and distortion of the grid emitted by the radiation emitters, are entered into the computer system 5 as a test signal. Any surface unevenness may then be determined and precisely located by suitable correlated surface coordinates on the body shell on the basis of this test signal. For recognition and rating of the surface defects, an error recognition software based on artificial intelligence techniques is used, which maps surface defects in imprecise ("fuzzy") form, classifies and, if necessary, corrects them. In addition, adaptive software is used so that new defect types can be simply supplemented as defect patterns or automatically constructed in an adaptation process. The marking device accommodated downstream from the measuring device applies a suitable mark to the surface defect on the body shell in accordance with the defect coordinate data acquired.

In contrast to the statements on page 4 of the Office Action the method of Alders, et al, for detecting selected surface defects does **not** include the feature that the location of the flaw on the object is determined from the design data related to the object (including surface coordinates of the body shell 2) and the optical imaging properties of the at least one optical image-taking device when the picture is taken by it.

US 5,716,262 (Kiba) discloses a defect polishing robot 1 comprising a polishing head for eliminating paint surface defects by polishing up to a certain predetermined number and a marking head 3 for marking excess paint surface defects for later processing. The robot 1 has a robot arm 2 provided at its end

with a surface inspection apparatus 4 directly secured thereto, and a marking head 3, which is attached to another arm 9b of the L-shaped mounting bracket 9. The robot arm 2 is further provided at the end with a reversible motor 10 with a vertically oriented center axis of rotation, which turns a mounting bracket 9 in both directions through an angle of 90 degrees around the center axis of rotation of the motor 10. This alternately places the marking head 3 or the polishing head 5 in a working position. The surface defect inspection apparatus 4 includes an image pick-up device such as a CCD camera 6 and a light source 8 mounted within a lamp house or housing 7. The CCD camera 6 takes a picture of an illuminated surface of a subject work, such as a painted vehicle body B, on a charge coupled device (CCD). In operation, the polishing robot 1 acts to inspection for and eliminate paint defects. The surface inspection apparatus 4 picks up an image of a circular unit area having a diameter of, for instance, approximately 50 mm of the painted surface and processes data representative of the image so as to detect and locate paint defects, grade the defects and determine their positions in an X-Y perpendicular coordinate system. Based on the position data of these paint defects, the polishing robot 1 operates the robot arm 2.

US Patent 6,667,800 B1 (Larsson, et al) discloses a method and apparatus for measuring and quantifying surface finishing defects, such as defects on polished surfaces, by means of optical registration with subsequent image analysis and processing. Figure 1 of Larsson, et al, shows a test surface 2, which is illuminated with parallel light from a first spot lighting source 3 and, at

the same time, camera 4 records a first image of the test surface 2. Thereafter, the first spot lighting source 3 is switched off and a second spot lighting source 5, adjacent to and parallel to the first spot lighting spot 3, illuminates the test surface 2 and, at the same time, camera 4 records a second image of the test surface 2. After that, first and second images are transferred to a central unit 7 that includes image analysis functions and control functions. In unit 7, the second image is subtracted from the first image (or *vice versa*) in order to provide a difference image. In the difference image, surface defects, such as polishing roses, appear with a certain intensity corresponding to the degree of severity of the surface defects being analyzed.

B. Rationale for the Rejection

The person skilled in the art would not ascertain that "design data" related to the object (including the coordinates of the object surface positions) and optical imaging properties of the optical image-taking device are known when the picture is taken from column 3, lines 37 to 40, of Alders, et al, and used to determine the location of the fault on the surface of the object from its position in the picture, as stated in the last paragraph on page 4 of the Office Action. The disclosure at column 3, lines 37 to 40, refers to grading the detected flaws according to the depth, extent and local frequency using standard defect data and patterns stored in memory. Although the method of Alders, et al, uses the body shell during the detection of the surface defects, this reference does **not**

teach that the design data used for creating the body shell are known to the system *per se*. The same applies for the optical imaging properties of the CCD cameras.

Furthermore Alders, et al, does **not** disclose that the start path for the marking device is determined based on the design data related to the object, the position data, <u>and</u> previously-defined, permissible areas of the movement of the marking device (see page 6 of the Office Action). Column 4, lines 9 to 16, of Alders, et al, does state that the marking device is moved to the defect or flaw and then marked using position data for the location of the defect or flaw read from the memory, but does not state that a start path is determined in the basis of design data related to the object (including the coordinates of all points defining the surface of the object) and permissible areas of movement.

Kiba does not teach that "design data" related to the object (including the position coordinates of all points defining the surface of the object) and optical imaging properties of the image-taking device are known and used to determine the location of the flaw or defect when the picture is taken, either. Also, Kiba does not disclose that the start path for the marking device is determined based on design data related to the object and previously-defined, permissible areas of the movement of the marking device. To the person skilled in the art, the disclosed X-Y perpendicular coordinate system of Kiba, on which position data the polishing robot 1 operates, form an <u>object-independent</u>, global coordinate system and are **not** related to the "design data" of the object, i.e. which includes the coordinates of all points defining the surface of the object used to design the

object, which are expressed in terms of a coordinate system that is fixed in relation to the object.

Also Larsson, et al, does **not** disclose a defect-marking device and does not state that design data related to the object (especially including the coordinates of all points on the surface of the object) and optical imaging properties of the picture-taking device are known when the picture is taken and used to determine the location of a flaw or defect from the flaw position in the picture. As Larsson, et al, does not refer to a marking device, and does not disclose how to determine a start path for the marking device, either.

It is likely that the system of Larsson, et al, uses a global X-Y coordinate system which is analogous to the coordinate system described in Kiba because, in column 6, lines 4 to 7, the document refers to correlation techniques used to clarify the appearance of surface defects at slightly different coordinates in different partial images. Thus it is likely Larsson, et al, does not utilize a coordinate system that is stationary or fixed in relation to the object itself.

With respect to the calibration features of claim 8 that have been included in claim 13 Larsson, et al, teaches a type of calibration at column 4, lines 51 to 54, as stated on page 8 of the Office Action, but the calibration is to be distinguished from the calibration of the applicants. Many different types of measurement instruments that measure different properties may be calibrated. Calibration only means the correction of raw measurement results of a measurement instruments according to a particular standard. In the case of the disclosures in column 4 of Larsson, et al, measured light intensities are

calibrated, but in the case of applicants' invention it is position data that is calibrated, i.e. the measured positions of points and flaws on the object are calibrated so that the position of the flaws are accurately determined.

Furthermore Kiba also does not appear to teach the three-dimensionally calibrating at column 4, line 64, to column 5, line 6.

Thus it is respectfully submitted that a case of *prima facie* obviousness of the new method claims 13 to 18 is not established by the combined disclosures of Alders, et al; Kiba; and Larsson, et al. In the case of the present inventive method according to claims 13 to 18 many essential features of the claimed invention cannot be found in the combined subject matter of these three prior art references.

However according to M.P.E.P. 2143.04 all limitations of a claimed invention must be considered during examination to determine whether the claimed invention is obvious or not, even if they are indefinite.

Federal Circuit has held that an invention is **not** obvious when there is no reason identified that would have led one skilled in the art to modify the prior art method in a particular manner to establish *prima facie* obviousness of the new method under ***KSR***. ***Takeda Chem. Indus. V. Alphapharm Pty., Ltd.***, 492 F.3rd 1350, 1356 (Fed. Cir. 2007). A similar case with the same conclusion that follows ***Takeda*** : ***Eisai v. Dr. Reddy's Lab, and Teva Pharmaceuticals***, 2007-1397, 1398 (Fed. Cir. July 21, 2008).

Here the combined prior art does not teach and no reason is described in the Office Action for modifying the combined disclosures:

(1) the three-dimensionally calibrating (calibrating measured position data) of canceled claim 8, which is now in claim 13;

(2) that "design data" related to the object (including the coordinates of the object surface positions) and optical imaging properties of the optical image-taking device are known when the picture is taken and used to determine the location of the fault on the surface of the object from its position in the picture;

(3) that the start path for the marking device is determined based on the design data related to the object, the position data, and previously-defined, permissible areas of the movement of the marking device.

For the foregoing reasons it is respectfully submitted that new method claims 13 to 18 should **not** be rejected as obvious under 35 U.S.C. 103 (a) over under 35 U.S.C. 103 (a) over Alders, et al, in view of Kiba with or without Larsson, et al.

2. The New Marking System Claims

New independent marking system claim 19 includes features and limitations from claims 9, 10, 12 and the additional feature that the marking control determines a start path for the marking device based on design data related to the object and on the position data and previously-defined areas of

movement for the marking device.

New dependent claim 20 includes the limitations of canceled claim 11.

Thus the new marking device claims 19 and 20 clearly avoid a rejection for obviousness based on a combination of Alders, et al, and Kiba, **with or without** Larsson, et al, because the addition of the disclosures of Shimbara were required to reject claims 10 to 12 for obviousness according to page 9 of the Office Action.

A. Scope and Content of the Prior Art

Since claim 19 includes features from claims 11 and 12, the relevant obviousness rejection is the rejection of claims 10 to 12 as obvious under 35 U.S.C. 103 (a) over Alders, et al, in view of Kiba and Shimbara.

Alders, et al, and Kiba have been described above in connection with the method claims.

US Patent 5,625,197 (Shimbara) discloses a method of determining a time at which an image of illuminated surface area is read in for image processing to detect surface defects. In the method of Shimbara a painted vehicle body 1, which is placed on a truck 11 moving at a specified speed in a lengthwise travel direction A toward an inspection station 3. The inspection station 3 comprises work sensors 7 and 13. Work sensor 7 detects when the vehicle body 1 is placed in a specific reference position in the inspection station 3 and work sensor 13 detects a transverse displacement of the vehicle body 1. Data from these work

sensors 7 and 13 are used to determine the position and speed of the vehicle body 1 within the inspection station 3 using a complicated procedure (column 3, line 61 to column 4, line 21 of Shimbara). In the vehicle manufacturing line, the image pick-up device 9 starts to pick up images of the surface of the painted vehicle body 1 after the work sensor 7 detects the painted vehicle body 1 and provides a signal (see column 4, line 58, to column 5, line 14). In order to pick up images with the image pick-up device 9, a surface light source provides a fixed area of illumination incident upon the surface of the vehicle body 1 at a specified incident angle so as to illuminate at least a part of the body surface covered within the field of view of each image pick-up device 9. Since the vehicle body 1 is transported at a constant speed in the travel direction A, the area illumination scans over the entire surface of the vehicle body 1 from the front and to the rear end. With this procedure, the entire surface of the vehicle body 1 is spatially divided into a plurality of lengthwise sections having a lengthwise width corresponding to the scanning interval. Images of these sections are read into an image processing unit 12.

Shimbara discloses a method for handling changes in the width of an illuminated area on a surface that is being inspected even though a specified area of illumination is given at which light strikes the surface. This change occurs due to unevenness of subject surface. In order to determine a scanning interval at which a subject surface is scanned without any omission of image reading, the picture elements are transformed into two-valued image data and represented by rectangular coordinates along an X-axis a perpendicular Y-axis direction.

Additionally, a histogram of picture elements is used to determine a scanning interval at which the area of illumination and the image pickup device are moved relative to the subject surface in the scanning direction.

B. Rationale for the Rejection

Thus the system and method of Shimbara use a global X-Y-coordinate system that is not fixed in relation to the object and do not locate flaws wherein design data related to the object and optical imaging properties of the image-taking device are known and the location of the flaw on the object is determined there from given the information gathered by the inspection system.

Furthermore Shimbara does not disclose that the marking control determines the start path considering "said design data related to the object (2)", "said position data" and "previously-defined, permissible areas of movement of the marking device (15)". Shimbara does not disclose the features of canceled claim 5 that have been incorporated in the main marking system claim 19.

For the foregoing reasons it is respectfully submitted that claims 19 and 20 should not be rejected as obvious under 35 U.S.C. 103 (a) over Alders, et al, in view of Kiba and Shimbara.

Should the Examiner require or consider it advisable that the specification, claims and/or drawing be further amended or corrected in formal respects to put this case in condition for final allowance, then it is requested that such amendments or corrections be carried out by Examiner's Amendment and the case passed to issue. Alternatively, should the Examiner feel that a personal discussion might be helpful in advancing the case to allowance, he or she is invited to telephone the undersigned at 1-631-549-4700.

In view of the foregoing, favorable allowance is respectfully solicited.

Respectfully submitted,

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